SCIENCE

NEW SERIES
VOL. XLIX, No. 1265

FRIDAY, MARCH 28, 1919

SINGLE COPIES, 15 CTS.
ANNUAL SUBSCRIPTION, $5.00

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MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

HORTICULTURE AS A PROFESSION[1]

THE advancement of civilization is marked by certain well-defined epochs. There are the old stone age and the new stone age, the age of bronze, the age of steam, the age of electricity. More recently events have moved forward with prodigious acceleration. We were no sooner beginning to think of the present as the age of the automobile, than the airplane rose above the horizon, and the age of flight was ushered in. The discovery of the telephone, the wireless telegraph and the wireless telephone would either of them have been of sufficient moment to give a name to a new epoch had they only been separated by sufficiently long intervals.

So it has been with the emancipation of woman. So-called "female seminaries" were followed shortly by women's colleges, and by coeducation in the liberal arts colleges of our universities. Finally the professional schools opened wide their doors, and we became accustomed to women lawyers, doctors, and engineers. The great world war disclosed the fact that there was one occupation essentially masculine, but the departure to France of some two million or more of our male population as fighters spelled Opportunity with a capital O for the daughters of men, and we have now become familiar with women munitions workers, women street-car conductors, women elevator "boys," and women messenger "boys."

Certainly we are living in an age of rapid

[1] Address to the graduating class of the School of Horticulture for Women, Ambler, Pa., December 13, 1918.

progress, and the oldest and most fundamental of all human pursuits—the cultivation of the soil—has not remained untouched. Just as agriculture is one of the oldest occupations of man, so, also, is it one of the oldest occupations of women. It was part of the business of the Indian squaw to scratch up the earth and plant and cultivate corn, while her lord and master was busy in the so-called "larger sphere" outside the home. We recall, with no particular feeling of pride in our species, the fact that in some countries women, as a matter of general practise, were yoked with the oxen in plowing. One particularly militant woman of my acquaintance has remarked that this lot was preferable to being yoked for life to the owner of the oxen!

But every concession is dangerous, unless one is prepared to go the entire logical length of the course. The modern man knows this only too well. Freedom of action outside the four walls of the home is a wonderfully broadening process, for woman as well as for man. If I can pull the plow with the ox, why might I not plan and supervise the work, and even own the ox, and the plow, and the farm? Nothing is more unsettling than questions unanswered; nothing is more enlightening than the pursuit of the answer; nothing is more convincing than the particular answer one very much wishes to find. Why, indeed?

The history of the intervening steps and struggles and advances is too long to be here reviewed, but we are all familiar with the results—the bill of rights, the declaration of independence, the emancipation proclamation, equal suffrage, and a seat in Congress. So I find myself, this afternoon, addressing the graduates of a school of horticulture for women.

In that charming forerunner of our modern popular books on gardening, "My Summer in a Garden," Charles Dudley Warner makes the unguarded statement that "Women always did, from the first, make a muss in a garden." This poorly concealed reference to Eve and Eden was a mean fling, and I found myself saying, as I read it, that, if Charles Dudley Warner had been writing in 1918, he would have been more circumspect in his statements—especially if he had any thought of running for public office. But as I read on, I found that his wisdom and judgment had not wholly forsaken him, for he continues:

> But I am not an alarmist . . . I am quite ready to say to Polly or to any other woman, "You can have the ballot; only leave me the vegetables." . . . But, I see how it is. Woman is now supreme in the house. She already stretches out her hand to grasp the garden. She will gradually control everything. . . . "Let me raise the vegetables of a nation," says Polly, "and I care not who makes its politics."

Here we have an inspiration to return to the *modus vivendi* of the red Indian. In biology we would call it atavism; it is always an indication that progress has taken place.

But there is another and more serious reason why Charles Dudley Warner would have written otherwise to-day. He, and his contemporaries had probably never heard of a school of horticulture *for women*. Now schools of horticulture for women exist for the express purpose of educating women so that they shall not make a muss in the garden—just as law and medical schools exist so that men and women shall not "make a muss" in law and medicine—just as schools of horticulture for men aim to prevent men from making a muss in a garden—in other words, to make horticulture a profession, and not merely an occupation. This is the theme which I wish briefly to elaborate and emphasize this afternoon—*horticulture a profession.*

Superficially we all know the difference between a trade and a profession. For ex-

ample, one holds a position, not a job; he is employed by the month or year, not by the day; he earns a salary, not wages. But these are all superficial differences. There are other distinctions, significant, fundamental. May I speak briefly of two of them?

First, The Nature of the Preparation Required.—One may learn how to raise vegetables and flowers with success by beginning as gardener's helper, imitating the experienced practitioner, substituting in his absence, and thus gradually acquiring sufficient skill to proceed independently, and, in turn, pass on his information and skill to other apprentices. But, with rare exceptions, what the journeyman has learned, is all that he can pass on; like father, like son. But where is the opportunity for progress here? The history of agriculture in China, or Palestine, or with our own aborigines, gives the clear answer. There is little or no opportunity for progress. Cloth would be spun on hand looms to-day had no other factor been introduced into spinning than the instruction of daughters by mothers. This kind of instruction does not make for progress; it can never convert a trade into a profession. The spinning jenny was not invented by a spinner, nor the wireless telegraph by a telegraph operator, nor the science of agronomy by practical farmers.

Progress depends upon a fullness of preparation exceeding the limits of anticipated requirement in practise. This is why I have never liked the phrase, "teachers *training* class." Horses may be trained, and a well-trained horse may be depended on to do accurately and promptly the tricks that are taught him. But place him in a new situation, or confront him with a new problem, or an old one somewhat altered—and you may then learn clearly and easily the difference between training and education.

In order to become a horticulturist, as distinguished from a practical gardener, one's knowledge must exceed the anticipated demands upon it in practise. He must not only know how and when to cultivate, but why; not only the names of his plants, but the nature of plants—why leaves are green, what flowers are for, how seeds are formed, how roots absorb moisture, how plants feed, the nature of plant diseases (as well as when and how to spray), the nature and kinds of variation, the basis of selection, why some varieties tend to run out, why corn "mixes in the hill." This is the knowledge that gives power, this is the basis of progress. I do not mean that such fullness of knowledge is always necessary in order to raise good crops—to be a good gardener; but it is necesary in order to be able still to raise good crops in spite of unforeseen obstacles—the new insect or fungus pest, an excessive drought, a season of unusual weather in general; it is necessary in order to raise increasingly better crops, in order to introduce improvements in practise, in order to become a horticulturist.

Horticulture is an art, and like all arts, it is based upon certain sciences; a knowledge of these fundamental sciences is necessary—soil technology, economic entomology, the elements of botany, with special emphasis on plant physiology; something of plant pathology, the principles of plant breeding, ecology or the relation of plants to their environment; something of physics and chemistry, plant geography, and the history of cultivated plants. Moreover one should know the history of his profession, be acquainted with the classic publications, the names and lives of the founders and leading horticulturists. One can never keep abreast of the times (let alone becoming a leader) who does not keep in touch with the new and modern books, and the current periodical literature of the subject.

Membership in local and national organizations of gardeners or horticulturists is stimulating, if not essential.

And finally, one should have a hobby—one or more. Nothing is more narrowing than exclusive attention to one life-interest; nothing is more fatal to the best accomplishment; nothing so dwarfs one's soul. Years ago President Eliot, of Harvard University, tersely defined a liberal education as, "Everything of something and something of everything." The latter is almost, if not quite, as important as the former. Be horticulturists, or gardeners, or teachers of horticulture, but do not be *merely* horticulturists or teachers. Never lose sight of the fact that you are women first, horticulturists second, and that the largest success in one's lifework is quite as much a matter of breadth as of depth, of character as skill.

The second and last distinction I wish to emphasize between a trade and a profession is the personal attitude toward one's work. Why did you attend a school of horticulture? Why did you ever think you wanted to make some phase of gardening your life work? *Do you think so now,* after you have had a taste of it, or do you feel that you might, after all, be happier in some other occupation? These are vital questions; on the answers you can give to them depend your success or failure, if you persist in following the occupation for which you have been fitting yourself in this institution.

There is an occupation of gardening; there is a profession of horticulture. As I have stated above, in practise horticulture is an art; in theory it is an applied science, having a body of literature of its own, raised in its pursuit above the trammels of empiricism, yielding contributions to its own progress from within. Of all this you should aspire to be a part, not only making yourselves familiar with the literature, but contributing thereto; not only basing your own practise on wide knowledge of fundamentals, instead of on rule of thumb, but seeking to ascertain for yourselves new principles, or new applications of old principles; not only keeping abreast of progress, but endeavoring to contribute something substantial thereto—in some small degree, at least, to be leaders.

A friend of mine, a college professor, spending a summer in New York City, rented the furnished apartment of a teacher in one of the city high schools. After he had occupied the apartment for three or four weeks he asked me if I knew what subject the high school teacher taught. I replied that I did not, but inquired whether the answer to his question might not be found in the titles to the books and magazines in the apartment. To my surprise, and to his, no such incriminating evidence could be found. So far as anything about his home might suggest, he might have been a clerk or a bookkeeper, as well as a teacher. In view of what we have been saying, the significance of this is self-evident. To all appearances, this teacher of youth possessed no library of books, and subscribed for no magazines bearing on his own calling; are we not justified in concluding that his real interests were outside the pale of his daily occupation and his chosen life work. I was sorry for him; I was still more sorry for the pupils who were obliged to sit daily under his perfunctory instruction.

What I plead for is that you shall not view the vocation of horticulture *merely* as a means of earning a living or raising plants, or the avocation of horticulture merely as a means to planting your own garden or decorating your own home grounds. Food is good and we must have it; beauty is good and we must also have it. Objects of beauty are as necessary as food to right, complete living; but you can get

more than this, even, out of the study and practise of horticulture. The dignity and worth of the human spirit is a greater good, to which all else should be made to minister.

You are graduates of a technical school. There are some who go to a technical school with no other idea than to secure training for a profession; there are indeed some who contend that technical schools are necessarily limited in their work to preparation for a vocation, and this is the danger. At about the middle of the nineteenth century the controversy was rife in England as to whether professional studies had any place in a university. Cardinal Newman argued, with all the power of his eloquence, that it is the purpose of a university to confer, not a technical, but a *liberal* education; and he defined a liberal education as consisting in the culture of the intellect for its own sake, without reference to utilitarian ends.

One can hardly overestimate the value of a liberal education, thus defined, for all, no matter what their calling in life. Every one, whether horticulturist or doctor, or lawyer or engineer—whatever his vocation—must take his place in a community of individuals of varying degrees of culture, of other interests than his own, of broad as well as of narrow outlook, and he can not do it successfully by being merely a horticulturist, or a lawyer. The position he can take, the influence for good he can yield, will depend upon his own expansion of mind, the width of his own sympathies, the breadth of his own culture.

A recent editorial in a New York daily paper called attention to the fact that the French educational mission of seven savants, now in this country, contained but one scientist, and expressed great satisfaction at this fact, as indicating the contrast between French and German culture, of the latter of which we have had enough—*ad nauseam*. But the repugnant and unsavory character of German culture is not to be attributed to the extensive development of scientific studies in Germany, but to the fact that her entire educational system, in the schools and out, has been permeated with an antiquated, unchristian, inhuman, abhorrent system of ethics and morality. She was rotten at the heart.

I wish to emphasize the point that liberal education is not necessarily a matter of content—of non-utilitarian subjects—but of spirit and of methods. The studies of Greek, Latin and Hebrew were at first introduced into university instruction for utilitarian purposes, but soon became the foundation stones of a liberal education. The studies of medicine, law, theology, engineering, botany, horticulture, may be pursued in such a way as to produce *merely* doctors, lawyers, divines, engineers, botanists, horticulturists; or they may be pursued with a spirit and method that will produce, as well, men and women of broad culture—of liberal education, more competent in their professions, more creditable and satisfactory to themselves, more valuable in their communities. Make your horticultural study, then, not only a means of preparation for a vocation, but also a basis and means of education—of the enlargement of your minds, the enrichment of your lives, the expansion and perfection of your characters.

You are entering upon a noble calling. The outstanding names in horticulture—Vilmorin (father and son) and Lemoine in France, Thomas Andrew Knight, Veitch and Sutton in England, Robert Fortune in Scotland, Van Tubergen and de Vries in Holland, Correvon in Switzerland, Henderson, Meehan, Bailey, and others in America, would do honor to any profession. You have a reputation to maintain, and an obligation to maintain it.

Moreover, horticulture is one of the later and therefore, one of the finer fruits of civilization. "When ages grow to civility and elegancy," says Lord Bacon, in his essay on gardens, "men come to build stately sooner than to garden finely; as if gardening were the greater perfection." The domestication and cultivation of plants is intimately bound up with the time when men, hitherto accustomed to roam, and to depend upon a chance supply of food from wild plants and animals, first began to take up permanent abodes in communities, and therefore found it, not only convenient, but essential to have a local supply insured; yet from all we can learn of the most ancient civilizations, there were no gardens as we now know them. Culinary vegetables, for example, were raised in ancient Egypt, as we learn from inscriptions on the pyramid of Cheops, and from other sources; but while accounts of the splendor of Memphis speak of statues, temples, and palaces, no mention is anywhere made of gardens.

In his letter to Gallus, describing his Laurentian estate,[2] Pliny's mind is chiefly occupied with the details of his villa, and while he refers to his tennis court, to an exercise ground with a border of boxwood and rosemary, and to "a terrace walk that is fragrant with violets," mention of his garden seems quite incidental, and all we learn of it is that it "is clad with a number of mulberry and fig-trees"; in other words it does not appear to be a garden, as we understand the term, nor to loom large in the mind of its owner as one of the chief attractions of his summer home.

Even as late as the middle of the eighteenth century Horace Walpole said (in a letter to Conway), "I lament living in so barbarous an age, when we are come to so little perfection in gardening." But gardens and the domestication and cultivation of plants, were the inevitable, logical sequence of the establishment of homes and gradually they make their appearance and begin their evolution as one of the finer expressions of civilization.

"Happy is the man who loves flowers," wrote Henry Ward Beecher, and in pleading for more effective writing in American horticultural magazines, he referred to horticulture as "this elegant department of knowledge." Not only may the study of the science itself become an avenue of culture and refinement, but a study of its origins (as a phase of agriculture), and of its historical development leads into some of the most fascinating and illuminating chapters in the history of civilization. If the artificial production of fire is conceded to be one of the greatest steps forward in the intellectual ascent of man, the domestication of wild animals and plants is second only in importance, and the historical study of this wonderful achievement has ramifications that carry one back to the very dawn of civilization, and laterally into enriching contact with archeology, ethnology, geology, plant geography, ancient and modern history, evolution, philosophy and other departments of knowledge.

We know that some of our economic plants were cultivated by the lake-dwellers of Switzerland while they were yet in the neolithic stage of culture, some three thousand years or more before the Christian Era. "Farmers of Forty Centuries" is the fascinating title of Professor King's study of the agriculture of China; that is, some of our cultivated plants—a date or a grain of rice—represent an unbroken line of living protoplasm, and of human aspiration and upward struggle, extending back some 5,000 or 6,000 years. Like any department of human knowledge, the study of horticulture, thoroughly pursued in all its vari-

[2] "Letters," 1st Ser., Bk. 2, Letter XVII.

ous aspects, may become the inspiration and means of a liberal education.

It is probable that the immediate future will offer unusual opportunities in horticulture as in all other fields of worth while human endeavor. The restoration of devastated Europe will not be complete until it includes the esthetic as well as the merely utilitarian. Already the call has come to this country for trained gardeners, for the Hun's conception of the exigencies of war has included the wholesale destruction of trees, parks, orchards and gardens. It is worthy of mention at this time and place that the American Horticultural Society has already collected and forwarded to France the sum of several thousand dollars to be expended in the replacing of ruined fruit trees and orchards.

The need here at home has never been greater. The truth of Lord Bacon's statement has found abundant confirmation in America, for, notwithstanding the early introduction of nurseries and horticulture in the colonies—notably by the Princes, father, son and grandson, on Long Island (1725 and later), by Bartram (1728), Evans and Humphrey Marshall near Philadelphia, by Andrew Jackson Downing ("perhaps the fairest name in American horticultural literature"), by David Hosack (1801) in New York, by M'Mahon (1800), Bloodgood (1820), Hogg (1834), Parsons (1838), Landreth (1874), Thorburn (1802), and a host of other pioneers—notwithstanding these early labors, subsequent development has been slow. But we have now passed the pioneer stage of national development, and the conditions which, for a time, justified our shortcomings in esthetics have ceased to exist; the forests are cleared, the frontier has vanished, mud huts and log cabins (mere houses) have given place to real homes. We have even managed to survive the periods of mansard roofs and brown stone fronts, and our villages and cities have already begun to recognize the value of horticulture and landscape gardening in making centers of business places of beauty as well.

See your vocation, then, in broad perspective—in its relation to the sum total of things; to social needs, spiritual needs, civic needs, human needs—the development of your own character, of a more refined and cultured national character. We are living in one of the most, if not the most momentous period in human history. It is a wonderful privilege to be alive now—to be a part of all that is transpiring, to be entering now upon one's life work. Never has there been a greater need for the best in all things. The self-revelation of the unspeakable Hun has left us with a feeling of disgust, as if we had been in contact with something base and unclean, as indeed we have; and the need was never so urgent as now for an increase of knowledge and the wide diffusion of truth and of spiritual and material beauty. It is your function and privilege to cooperate with the architect, the landscape architect, the town planner, in making beautiful the habitations of men.

There are those to-day who are crying aloud in the land that the work before us of educational reconstruction shall be characterized by making everything primarily or even exclusively "practical"—by choosing our studies and placing our emphasis chiefly with reference to bread-and-butter considerations. This is the great danger ahead of us in our program of education; it is quite as unfortunate to lose sight of the ideal as to forget the material needs of life. A Brooklyn divine has tersely said that, in hitching his wagon to a star, the idealist has chiefly in mind the star, while the administrator—the man of affairs—has chiefly in mind the wagon. Hitch your wagon to a

star, by all means, in horticulture, but do not lose sight of either the wagon or the star.

Are you really interested in this work—in some phase of horticulture? If you are not, I commiserate you on the time you have spent at this school; if you are, I am glad to extend to you the most hearty congratulations and good wishes on the completion of your course here, and the commencement of the larger and more serious work upon which you are about to enter.

C. Stuart Gager
Brooklyn Botanic Garden

LETTER ON THE SMITHSONIAN INSTITUTION[1]

BY THE LATE PROFESSOR LOUIS AGASSIZ

Addressed to the Honorable Charles W. Upham

Dear Sir,—Every scientific man in this country has been watching with intense interest the proceedings of the Smithsonian Institution ever since its foundation, satisfied, as all must be, that upon its prosperity the progress of science in America in a very great measure depends. The controversies which have been lately carried on respecting the management of the institution have increased the solicitude of its friends with regard to its future prospects in a degree which can hardly be realized by those who are not immediately connected with the cause of science.

As a foreigner, who has enjoyed but for a few years the privilege of adding his small share to support the powerful impulse which scientific investigations have lately received from those who are the native representatives of science in America, I have thus far abstained from taking any part in this discussion, for fear of being charged with meddling with matters in which I have no concern. There is, however, one feature of the institution itself, which may, I trust, justify the step I have taken in addressing you upon this subject as the chairman of the committee elected by the House of Representatives to investigate the proceedings of that establishment.

With the exception of a few indirect allusions, I do not see that any reference is made in the discussion now going on to the indisputable fact that the Smithsonian Institution is not an American institution. It was originated by the liberality of a high-minded English gentleman, intrusting his fortune to the United States to found in Washington an institution *to increase and diffuse knowledge among men.* America, in accepting the trust, has obtained the exclusive management of the most important and the most richly endowed scientific institution in the world: but it is at the same time responsible to the scientific world at large for the successful prosecution of the object of the trust, which is to *increase* and *diffuse* knowledge among men.

Were it not for this universal character of the institution, I would not think it becoming in me to offer any suggestion with regard to it. As it is, I feel a double interest in its prosperity—in the first place, as an institution designed to foster the process of science at large, and without reference to nationalities or local interests, and next, as more immediately connected with the advancement of science in the country of my adoption.

The votaries of science may differ in their views about the best means of advancing science, according to the progress they have themselves made in its prosecution; but there is one standard of appreciation which can not fail to guide rightly those who would form a candid opinion about it. I mean the lives of those who have most extensively contributed in enlarging the boundaries of knowledge.

There are two individuals who may, without qualification, be considered the most prominent scientific men of the nineteenth century—Cuvier and Humboldt. By what means have they given such powerful impulse to science? How have they succeeded not only in increasing the amount of knowledge of their age, but also in founding new branches of science? It is by their own publications and by aiding

[1] From *Canadian Journal*, Vol. III., 1854 and 1855, pp. 216–217, in the April number for 1855. containing Proceedings of the Canadian Institute. Communicated by Dr. Otto Klotz, Dominion Observatory, Ottawa, Canada.

in the publications of others; by making large collections of specimens and other scientific apparatus, and not by the accumulation of large libraries. Humboldt never owned a book, *not even a copy of his own works,* as I know from his own lips. "He was too poor," he once said to me, "to secure a copy of them"; and all the works he receives constantly from his scientific friends are distributed by him to needy students.

Again, there is hardly a scientific man living on the continent of Europe, who is not indebted to him for some recommendations in the proper quarter for assistance in the publication of their works. I mention more particularly these details about Humboldt, because he is happily still among the living, and his testimony may be asked in a matter of such deep importance to the real progress of science. But the same is equally true of the part Cuvier took in his day in promoting science. All his efforts were constantly turned towards increasing the collection of the *Jardin des Plantes,* and supporting the publication of original researches, giving himself the example of the most untiring activity in publishing his own.

In this connection, I ought not to omit mentioning a circumstance to which the United States owes the legacy of Smithson, which I happen accidentally to know, and which is much to the point, in reference to the controversy concerning the management of the Smithsonian Institution.

Smithson had already made his will, and left his fortune to the Royal Society of London, when certain scientific papers were offered to that learned body for publication. Notwithstanding his efforts to have them published in their transactions, they were refused; upon which he changed his will and made his bequest to the United States. It would be easy to collect in London more minute information upon this occurrence and, should it appear desirable, I think I could put the committee in the way of learning all the circumstances. Nothing seems to me to indicate more plainly what were the testator's views respecting the best means of promoting science than this fact.

I will not deny the great importance of libraries, and no one has felt more keenly the want of an extensive scientific library than I since I have been in the United States; but, after all, libraries are only tools of a secondary value to those who are really endowed by nature with the power of making original researches, and thus increasing knowledge among men. And though the absence or deficiency of libraries is nowhere so deeply felt as in America, the application of the funds of the Smithsonian Institution to the formation of a library, *beyond the requirements of the daily progress of science,* would only be, in my humble opinion a perversion of the real object of the trust, inasmuch as it would tend to secure facilities only to the comparatively small number of American students who may have the time and means to visit Washington when they wish to consult a library. Such an application of the funds would in fact lessen the ability of the Smithsonian Institution to accomplish its great object (which is declared by its founder to be the increase and diffusion of knowledge among men) to the full extent to which they may be spent towards increasing unduly the library.

Moreover, American students have a just claim upon their own country for such local facilities as the accumulation of books affords.

If I am allowed, in conclusion, to state my personal impression respecting the management of the institution thus far, I would only express my concurrence with the plan of active operations adopted by the regents, which has led to the publication of a series of volumes, equal in scientific value to any production of the same kind issued by learned societies anywhere.

The distribution of the Smithsonian Contributions to Knowledge has already carried the name of the Institution to all parts of the civilized world, and conveyed with them such evidence of the intellectual activity of America as challenges everywhere admiration: a result which could hardly be obtained by applying the resources of the institution to other purposes.

SCIENTIFIC EVENTS

CHARLES LEANDER DOOLITTLE

As an expression of sorrow over the death of Professor Charles L. Doolittle, the college faculty of the University of Pennsylvania recently passed the following resolutions:

The college faculty learns with profound grief of the death of their colleague, Professor Charles Leander Doolittle, who has been associated with them since 1895, at first as professor of mathematics and astronomy, and since 1899, when these departments were separated, as professor of astronomy, until his retirement from active duty in 1912.

Professor Doolittle's position in the world of astronomy was a distinguished one, and not only this university but the scientific world at large has by his death sustained a great loss.

As a colleague, Professor Doolittle was ever ready to bear his part in helping to solve the perplexing problems which naturally arise in conducting the affairs of a great university, and by his wisdom to assist in reaching such conclusions as would further the best interests of students and institution.

In deploring the loss of a helpful counsellor and a genial friend, the members of the college faculty desire to extend to Professor Doolittle's family their sincere sympathy. They also direct that this record of their action be entered on the minutes and that it be inserted in the appropriate university publications.

Edwin S. Crawley,
Henry Brown Evans,
Samuel G. Barton,
Committee of the College Faculty

AIRPLANE FUEL

During the war the Bureau of Mines, Department of the Interior, made strenuous efforts to find a special fuel for airplanes that would be superior to others already in use. Of the numerous products and mixtures obtained some were originated by the bureau engineers and chemists, others were suggestions by outside interests. Through its own experiments or by cooperation with other organizations, notably the research division of the Dayton Metal Products Co., and the Bureau of Standards, it was possible to establish the fact that certain types of fuels had elements of superiority that had not before been noted or appreciated. Of the fuels proving most satisfactory, gasoline refined from the crude petroleum of certain producing fields was distinctly superior to the type most extensively used. The blending of moderate proportions of benzol with gasoline was found to be distinctly advantageous, and motor fuel of this type would undoubtedly have been employed for military purposes if the war had continued much longer. It is believed that through the proper use of benzol and other distillates derived from coal it may be possible to embody features in the design of internal combustion motors that will notably increase their efficiency. Benzol and other coal-derived fuels are already being sold for use in automobiles and are believed to be giving satisfactory results even with present types of motors.

The bureau was particularly interested in a special fuel tested in cooperation with the Dayton organization and named "hector." This fuel, which was a mixture of cyclohexane, and benzol, gave indications of marked superiority over any other product tested and should, unless unforeseen deficiencies appear, prove ideal for the military aviation service. In some experimental flights this fuel has given 10 miles an hour more speed. It is not certain that the cost of production will ever be low enough to permit its use in peace times, but it is planned to complete the work of obtaining comprehensive information regarding all of its possibilities and to publish reports on the subject in cooperation with the engineers of the research division of the Dayton Metal Products Co.

NATIONAL RESEARCH FELLOWSHIPS IN PHYSICS AND CHEMISTRY SUPPORTED BY THE ROCKEFELLER FOUNDATION

The National Research Council has been entrusted by the Rockefeller Foundation with the expenditure of an appropriation of $500,000 within a period of five years for promoting fundamental research in physics and chemistry in educational institutions in the United States.

The primary feature of the project is the

initiation and maintenance of a system of National Research Fellowships, which are to be awarded by the National Research Council to persons who have demonstrated a high order of ability in research, for the purpose of enabling them to conduct investigations at educational institutions which make adequate provision for effective prosecution of research in physics or chemistry. The plan will include such supplementary features as may promote the broad purpose of the project and increase its efficiency.

Among the important results which are expected to follow from the execution of the plan may be mentioned:

1. Opening of a scientific career to a larger number of able investigators and their more thorough training in research, thus meeting an urgent need of our universities and industries.

2. Increase of knowledge in regard to the fundamental principles of physics and chemistry, upon which the progress of all the sciences and the development of industry depend.

3. Creation of more favorable conditions for research in the educational institutions of this country.

The project will be administered by the research fellowship board of the National Research Council. This board consists of six members appointed for terms of five years and of the chairmen *ex officio* of the Division of Physical Science and the Division of Chemistry and Chemical Technology of the National Research Council. The members of the board are:

Henry A. Bumstead, professor of physics, Yale University.

Simon Flexner, director of the Laboratories of the Rockefeller Institute for Medical Research.

George E. Hale, director of Mount Wilson Observatory.

Elmer P. Kohler, professor of chemistry, Harvard University.

Robert A. Millikan, professor of physics, University of Chicago.

Arthur A. Noyes, director of the Research Laboratory of Physical Chemistry, Massachusetts Institute of Technology.

Wilder D. Bancroft, professor of physical chemistry, Cornell University, chairman of the Division of Chemistry and Chemical Technology.

———— — ————, chairman of the Division of Physical Science.

The appointments of national research fellows will be made only after careful consideration of the scientific attainments of all candidates, not only of those who apply on their own initiative, but also of those who are brought to the attention of the research fellowship board by professors in educational institutions and by other investigators throughout the country.

The research fellowships will for the most part be awarded to persons who have had training at an American university or scientific school equivalent to that represented by the doctor's degree. The salary will ordinarily be $1,500 for the first year. The research fellowship board will not, however, be bound by rigid rules of procedure. Thus it may offer larger salaries to those of exceptional attainment or wider experience, and may give appointments to competent investigators who have had training other than that represented by the doctor's degree.

The research fellows will be appointed for one year; but they will be eligible for successive reappointments, ordinarily with increases of salary.

It is expected that fifteen to twenty research fellowships will be available during the coming year, and that the number will be increased in subsequent years.

Applications for the fellowships should be made on the form provided for the purpose, and should be sent to the secretary of the research fellowship board, National Research Council, 1023 Sixteenth Street, Washington, D. C. Applications will be received up to September 1, 1919, for fellowships available during the next academic year; but a limited number of appointments will be made on the basis of the applications received before April 20, 1919.

SCIENTIFIC NOTES AND NEWS

COLONEL E. LESTER JONES, after service in the Army for about a year in America and France has returned to his duties as head of the Coast and Geodetic Survey.

Lieutenant Colonel William McPherson, who entered the services of the War Department shortly after the declaration of war by the United States, has secured his discharge and has returned to his former position as head of the department of chemistry at the Ohio State University.

Professor Clough T. Burnett, professor of bacteriology in the University of Colorado, has returned from France, where he was the head of the commission for the prevention of tuberculosis.

Dr. H. C. Taylor, head of the department of agricultural economics in the college of agriculture, University of Wisconsin, has been appointed by the Secretary of Agriculture as chief of the Office of Farm Management. Francis W. Peck, of the University of Minnesota, has been appointed to the position of farm economist in the office.

The *Proceedings* of the Washington Academy of Sciences state that the following members of the Chemical Warfare Service have joined the staff of the Bureau of Standards since January: Captain J. M. Braham, in the electrochemical laboratory; Lieutenant C. W. Clifford, sugar laboratory; S. C. Langdon, electrochemical laboratory; F. W. Reynolds (formerly at Edgewood Arsenal), laboratory of metallurgical chemistry; P. Wrightsman, gas laboratory. Mr. J. R. Eckman, formerly of the Ordnance Department, has joined the staff of the bureau as chemist in the analytical laboratory; Mr. W. B. Newkirk, formerly with the Oxnard Sugar Company, as sugar technologist, and Mr. A. A. Benedict, formerly of of the University of Pittsburgh, as physicist in the sugar laboratory.

Professor W. B. Meldrum, formerly head of the department of chemistry at Haverford College and later in the Chemical Warfare Service on duty at the American University Experiment Station, has accepted a temporary position as chemical expert with the Price Section of the War Industries Board.

Dr. William T. Brigham, Sc.D., in charge of the Bernice Pauahi Bishop Museum, Honolulu, since its foundation, has resigned the directorship and the trustees have conferred upon him the title of director emeritus. Dr. Brigham continues his connection with the museum as curator of anthropology.

The Adams prize, value £250, has been awarded by the University of Cambridge, to Professor J. W. Nicholson, professor of mathematics at King's College, University of London.

A meeting of Unionists has been held at Oxford to consider the selection of a candidate to fill the vacancy in the representation in Parliament of the university caused by the elevation of Mr. R. E. Prothero to the peerage. It was decided to invite Mr. David G. Hogarth, fellow of Magdalen College, archeological explorer, geographer and author, to become the candidate. Mr. Hogarth is at present in Egypt.

Professor Alan M. Bateman, of the department of economic geology, Yale University, has been elected editor of the *Journal of Economic Geology*.

Dr. Graham Edgar, formerly secretary of the Washington office of the Research Information Service, National Research Council, has resigned and is now with the Nitrate Division of the Ordnance Department of the Army. Mr. Gordon S. Fulcher is his successor as secretary of the Information Service.

Dr. Walter M. Mitchell, recently manager of inspection for the Bureau of Aircraft Production, U. S. War Department, in Rochester, N. Y., has been appointed director of the metallurgical and testing laboratory, Standard Roller Bearing Co., Philadelphia, Pa.

Dr. C. S. Hudson, chief of the carbohydrate laboratory of the Bureau of Chemistry, has resigned to accept a position with the Samuel Heath Company, of Trenton, N. J.

At a joint meeting of the Washington Academy of Sciences and the Philosophical Society of Washington on March 15, Dr. H. D. Curtis, of the Lick Observatory, delivered an address on "Modern theories of spiral nebulæ."

Lieutenant Colonel John R. Murlin, U. S. A., of the Surgeon General's Office, gave an

address on "Food efficiency in the United States Army" before the Washington Academy of Sciences on March 20.

AT the annual joint meeting of the Alabama Technical Association (Alabama Sections of the A. S. C. E., A. S. M. E., A. S. E. E. and A. C. S.), held in Birmingham on March 1, Professor Isaac Newton Kugelmass addressed the conference on "The relations of chemistry to modern laundering and its field for research in the economic service of man."

MAJOR R. M. YERKES, of the Office of the Surgeon General of the Army, delivered an illustrated lecture before the District of Columbia Chapter of the Sigma Xi on the subject, "The relationship of the army mental tests to education and vocational guidance" on March 6.

DR. J. MCKEEN CATTELL gave, on March 20, the address before the Syracuse University chapter of Phi Kappa Phi, the subject being "Science and civilization."

LECTURES recently given at the Royal Institution, London, include the following: Sir Oliver Lodge on "Ether and Matter"; Captain G. P. Thomson two lectures on "Aeroplanes in the Great War"; Professor H. M. Lefroy two lectures on "Insect Enemies of Our Food Supplies" and on "How Silk is Grown and Made"; Mr. A. T. Hare on "Clock Escapements."

A COMMITTEE has been formed to raise an endowment fund of $100,000 to perpetuate the method of after care for maternity cases evolved by the late Dr. Edwin Bradford Cragin, of the College of Physicians and Surgeons, Columbia University, in connection with the work of the Sloane Hospital for Women.

DR. HERBERT HUNTINGTON SMITH, curator at the museum of the University of Alabama, was killed on March 22 by a train. Dr. Smith, known for his work in entomology and on mollusca, was born at Manlius, N. Y., in 1851.

ELIZABETH LETSON BRYAN, wife of Professor William Alanson Bryan, of the College of Hawaii, died on February 28, aged forty-four years. Dr. Bryan before her marriage was director of the Museum of the Buffalo Society of Natural Science and was known for her contributions to conchology.

ON account of the disturbed conditions of transportation, etc., the session of the Twentieth International Congress of Americanists has been postponed until June, 1920.

JOSEPH and John W. Mailliard, prominent business men of San Francisco and well-known students of American birds, have donated their entire ornithological and oological collections to the Museum of the California Academy of Sciences. These collections contain more than 11,000 birds and over 13,000 specimens of nests and eggs, representing nearly 800 species. Joseph Mailliard has accepted the position of honorary curator, department of ornithology, in the museum of the academy.

THE trustees of the British Museum have had presented to them a valuable collection of ancient British coins by Sir Arthur Evans, to whom they were bequeathed by his father, Sir John Evans, the distinguished archeologist. Sir John Evans, in 1864 wrote an important book on "The Coins of Ancient Britain."

THE Puget Sound Biological Station at Friday Harbor, Washington, will open on June 16, 1919, its sixteenth annual session, which is to continue for six weeks. The station will be open to independent workers until October; and as early as June 1, if arrangements are made with the director. The earlier part of the season is the best for embryological work. Tents and research rooms may be reserved by writing the director, T. C. Frye, University of Washington, Seattle.

IN the act making appropriation for the legislative, executive and judicial expenses of the government for the fiscal year ending June 30, 1920, there is provision for increased compensation amounting to $240 per annum for all employees holding regular appointments in the Bureau of Fisheries now receiving $2,500 or less. This increase becomes effective on July 1, 1919, and is in lieu of the existing increase of $120 per annum.

THE following letter addressed by the editor of SCIENCE to M. George Sarton at Wondelgem-

lez-gand, Belgium, on January 22, 1915, was delivered to him at Cambridge, Mass., on March 10, 1919.

You may be interested in a letter which Professor Smith has, at my suggestion, written for SCIENCE. I greatly admire your courage in continuing *Isis* under the lamentable conditions now existing. The journal is of such high standards that its discontinuance would be a serious loss to science. The publication department of *The Popular Science Monthly* has handed me the enclosed letter and the writer has been informed that it will be forwarded to you.

The printing of the letter may serve to call attention to the fact that the publication of *Isis* has now been resumed under the editorship of M. Sarton.

THE National Forest Reservation Commission has approved for purchase 54,744 acres of land for national forests in the White Mountains, Southern Appalachians and Arkansas. The largest tracts purchased are in Georgia, where the resumption of purchase work has been authorized by the commission. An aggregate area of 38,108 acres in Rabun, Union and Townes counties, scattered through thirty-nine tracts, was approved for purchase at an average price of $7,22 per acre. In Alabama, in Lawrence and Winston counties, 5,159 acres were approved at an average price of $4.30; in North Carolina, in Macon and Buncombe counties, 1,940 acres were approved at an average price of $4.30 an acre; in Virginia, in Augusta and Shenandoah counties, 1,381 acres were approved at an average price of $4.36 an acre in West Virginia, in Hardy county, 40 acres at an average price of $7 an acre; and in New Hampshire, in Grafton and Coos counties, 9.04 acres at an average price of $6.68 an acre. In Arkansas, 7,269 acres, located mainly in Polk, Pope, Johnson and Garland counties, were approved for purchase at an average price of $3.61 per acre. To date the National Forest Reservation Commission has approved for purchase 1,702,534 acres for national forest purposes in the seventeen areas of eastern national forests.

Nature states that with the view of meeting the growing demand for technical literature, the council of the Chemical Society decided early in 1917 to increase the scope of the library of the society by a more liberal provision of suitable technical works and journals It was also thought that by placing the existing library of 23,000 volumes and the proposed extension at the disposal of members of other societies and associations they might relieve themselves of the necessity of collecting and maintaining the literature relating to their special subjects, and assist in the formation of a representative library of chemical literature, such as would be difficult to obtain by individual effort. A conference of representatives of societies and associations connected with chemical science and industry was held to consider the means by which other societies, etc., might cooperate in this extension, and financial assistance was afterwards offered by the following societies, etc.: Association of British Chemical Manufacturers, Biochemical Society, Faraday Society, Institute of Chemistry, Society of Dyers and Colorists, and Society of Public Analysts. Members of these contributing societies, etc., will be permitted to consult the library and borrow books.

THE Royal Institution, London, arranged a Christmas course of juvenile lectures which were delivered by Professor D'Arcy Thompson on "The Fish of the Sea," beginning on December 31 at 3 o'clock. The following courses of lectures are included in its program: Professor Spenser Wilkinson, "Lessons of the War"; Professor MacGregor-Morris, "Study of Electric Arcs and their Applications"; Captain G. P. Thomson, "The Development of Aeroplanes in the Great War and The Dynamics of Flying"; Professor Hele-Shaw, "Clutches"; Professor Arthur Keith. "British Ethnology: The People of Scotland"; Professor Norman Collie, "Chemical Studies of Oriental Porcelain"; Dr. W. Wilson, "The Movements of the Sun, Earth and Moon"; Professor H. M. Lefroy, "Insect Enemies of our Food Supplies and How Silk is Grown and Made"; Professor C. H. Lees, "Fire Cracks and the Forces Producing Them"; Professor

A. Findlay, "Colloidal Matter and its Properties"; and Sir J. J. Thomson, "Spectrum Analysis and its Application to Atomic Structure." The Faraday discourses began on January 17, when Sir James Dewar gave a lecture on "Liquid Air and the War"; and other discourses were announced by the following gentlement: Lieutenant Colonel A. Balfour, Professor H. H. Turner, Professor J. G. Adami, Professor C. G. Knott, Mr. A. T. Hare, Professor J. A. McClelland, Professor H C. H. Carpenter, Professor A. Keith, Professor W. W. Watts, Sir John H. A. Macdonald and Sir J. J. Thomson.

THE United States nitrate plants were built with the greatest urgency to meet imperative military necessities. These immediate military demands were extinguished by the signing of the armistice. The problem now is to endow these plants with the maximum peace-time value, while maintaining and enhancing their war efficiency. This involves new questions in the technique of fertilization, and requires not only constructive but creative work. Following a careful study of the situation, it has been decided to establish forthwith a civilian organization, under the interdepartmental control of the Secretaries of War, Navy, Interior, and Agriculture, to be known as the United States Fixed-Nitrogen Administration, and charged with all the government's fixed-nitrogen interests. In due course the nitrate plants and other interests now administered by the Nitrate Division of the Ordnance Department of the Army will be turned over to this new fixed-nitrogen administration. Mr. Arthur Graham Glasgow has been requested to act as first administrator and to be responsible for creating the new organization.

UNIVERSITY AND EDUCATIONAL NEWS

THE Oberlin College administration has appointed a special faculty committee to stimulate original research among members of the science division. Hereafter when appointments are made to the teaching staffs of the various science divisions special consideration will be given to candidates who have already demonstrated some particular degree of fitness in conducting original research.

RECENT demands for men skilled in geology have led to the development of a special course in practical geology which is being instituted at the engineering schools of Columbia University. The course is three years in length and is intended to train men for advisory and professional work in connection with engineering and other operations involving a knowledge of ground structure as well as for special studies of mining prospects and developments and other more formal geological investigations. The course leads to the degree of engineer of mines in geology.

DR. GEORGE NORLIN, professor of Greek in the University of Colorado, has been elected president to succeed President Farrand. Dr. Norlin was elected to the presidency by the regents on the recommendation of a committee of the faculty.

DR. RALPH R. DYKSTRA, for eight years a member of the faculty of the Kansas State Agricultural College, has been appointed head of the department of veterinary medicine.

DR. A. B. DAWSON, Ph.D., (Harvard, 1918), professor of biology in the Mount Allison University, has been appointed assistant professor of microscopical anatomy in the Loyola University School of Medicine.

THE senate of London University has appointed Dr. Reginald R. Gates, M.A. (Mount Allison), D.Sc. (McGill), Ph.D. (Chicago), for three years as from January 1, 1919, to the newly-established university readership in botany tenable at King's College.

DISCUSSION AND CORRESPONDENCE

GERMAN TERMS IN ANATOMY

THE Anatomical Society of Great Britain and Ireland, at a meeting on March 1, 1918 at King's College, London, received and unanimously adopted a report by its Committee on Nomenclature. It resolved, without a dissentient vote, that the following paragraph of the report should be circulated among the several corporations and other bodies interested in the progress of medical education:

"The Committee, after consideration of the matter, unanimously reports that it sees no reason for departing from the use of the old nomenclature as the recognized medium of description for employment in anatomical textbooks and departments, or by medical men in general; on the other hand, it thinks that there are very good reasons to be urged against the adoption of any other nomenclature for this purpose."[1]

In accordance with this vote, inquiries are being made as to the attitude of various institutions toward the "old terminology" and the "new or Basle terminology," for it is recognized that "an educational problem of far reaching importance is at stake, on which the United States of America and the British Dominions have the right to be heard and their opinions considered." Meanwhile the arguments against the Basle terminology, which without any edict to enforce it, but through its inherent excellence, has been so generally adopted, are set forth by Professor Keith in the *British Medical Journal* of July, 1917. "Cursed be he that removeth his neighbour's landmarks" is his text, preceding the examination of what he terms "a wild ass movement" whereby a scheme of names is "being forced on English-speaking medical men." From all of which it would appear, to one who finds merit in the Basle nomenclature, that there is danger that great harm may be done through rulings of organizations, moved at present by justifiable anti-German feeling rather than by impartial considerations of science. Is this a favorable time to act in such a matter?

The Basle nomenclature, although prepared by a distinguished committee of German anatomists, is not German, but Latin, and there is no doubt that an international terminology for anatomy ought to be in Latin. It aims to be in correct Latin without abbreviations, and is an impressively scholarly achievement, placing anatomical terms on a far more dignified basis than those current, for example, in surgery. Whatever may be said of an occasional error in judgment—and there is extraordinary difference of opinion in the selection of these errors—the principles of the system are sound, and instead of being abandoned, should be extended to other branches. How difficult this task would prove is shown by the failure of international committees to make any progress with an embryological terminology or with one for comparative anatomy. These failures show the skill with which the Basle nomenclature was produced. The real question is, shall it be abandoned because of its German origin?

German in origin it certainly is, although the committee appointed certain collaborators from other countries and expressed its appreciation of the cooperation of Professors Thane, Romiti and Leboucq. No American member was appointed, partly because of distance and partly because Americans seemed committed to a "telegraphic system" whereby, for example, the vena cava posterior was designated the postcava. There is no defense for this system, and the committee acted wisely. It evidently appreciated Huxley's maxim that in the multitude of counsellors there is wisdom—in a few of them. So ten able anatomists worked by themselves for six years to simplify and improve nomenclature along the sound principles which they had adopted. We can not call this "the caprice of a handful of enthusiasts."[2]

The Basle nomenclature is surely not beyond criticism, but criticism should be concerned first of all with the principles involved. If those are sound and the system can be accepted, as it has been generally, then criticism as to the application of those principles in special cases may be constructive. What seems unprofitable is for every one to select here and there a term objectionable to himself and to set that forth in condemnation of the whole, as is usually done. Is it better to call the chief foramen of the mandible the *mandibular foramen,* or the

[1] This entire paragraph is quoted from the *British Med. Journ.*, March 30, 1918, p. 378.

[2] Editorial, *British Med. Journal*, July, 1917, pp. 121–122.

dental foramen? A dental foramen should be a foramen of, or pertaining to, a tooth, but would be applied in this case to a foramen of the mandible which transmits a nerve with branches to the teeth. Is *musculo-spiral* a well-constructed designation for a nerve containing both sensory and motor fibers, which passes somewhat spirally to the radial side of the arm of which it is the chief supply, or is it better to call it the *radial nerve*? The writer of the editorial previously cited prefers dental foramen and musculo-spiral nerve, together with several other rejected names which can not be discussed here. For example, he considers that a nerve which passes through a notch in the upper border of the scapula is properly designated in the Basle nomenclature the *suprascapular nerve*, but he believes that the notch of the scapula through which it passes is faultily named scapular instead of suprascapular. Here there is apparently an unsuspected precision in the Basle distinction which makes a part of the scapula *scapular*, and a structure above the scapula *suprascapular*. It should be noted that the editors announce that they would be the last to reject this system because of its German origin. On its merits and demerits they counsel British physicians not to accept it, even though "it has now been introduced in our most widely circulated manuals of anatomy."

Whatever terminology American anatomists may finally adopt, and they are, as every one knows, using the Basle nomenclature very extensively, it would be a cause of great regret if any issue were raised with their English colleagues, whose preeminence in descriptive anatomy is acknowledged, and whose Gray, Quain and Cunningham, the last with the Basle terminology, have been so profitably used for the instruction of our students. Recognizing fully the annoyance from petty changes in names and the great provocation, it may yet be hoped that the present opinion of the British anatomists is not final.

But in another important matter of terms, Americans ought certainly to change their practise and follow British usage. This is in the rejection of *anlage*, which indeed is only a single term, yet one used so frequently that it gives German color to a large part of our embryological literature. Some Americans never use the word, but others display it five times on a page, and it perhaps deserves special attention.

Wolff and the early embryologists used a variety of terms for anlage, such as rudimentum, tentamentum, fundamentum, primordium and initium, and Pander in his notable treatise in 1817 was content with Rudiment and Anfang, *e. g.*, die Anfänge der Wirbel. Von Baer used Anfang to some extent but preferred Anlage, changing Pander's phrase to "diese Anlagen der Wirbel," and perhaps through Von Baer anlage came to be a technical term. Americans studying in Germany thought it essential to borrow the word, since rudiment had come to imply a stunted organ, and fundament had an anatomical significance quite at variance with that desired. Either term may mean, however, exactly the beginning, the first indication, or primordium. So important was the use of anlage considered, that its definition has taken a prominent place in the introduction to certain American text-books, and the writer was among those taught that it was a *sine qua non* in embryology. Left in doubt whether the plural were better written anlagen or anlages, years ago I visited the venerable rhetorician, Professor Hill, for an opinion. "Is the English language then so poor that this idea can not be expressed without a foreign world?" he asked. "Oh yes, certainly, sir," I replied, with many reasons. "Then," said he, "if the language will be enriched thereby, it should be adopted, and probably the English plural would be preferable."

The fact is, nevertheless, that the idea can be conveyed in English with far greater accuracy through the abundance of expressions available. This may be shown by citing conspicuous instances from our recent journals. "The anlage and morphogenesis of the chorda dorsalis," seems to mean "the origin and development of the notochord," or perhaps "the

earliest stages and subsequent transformation." "The equivalence of hematopoietic anlages" is, as may be read in the article, a reference to hematopoietic centers. This paper states that the endothelial cell is "a hematopoietic anlage," that is, a *source* of blood corpuscles. That it does not give rise to blood-cells (is not such an anlage) is the converse of this proposition, as recently expressed in the *British Journal*. All organs in young embryos instead of being called hearts, stomachs, etc., may be called anlages of the same, giving abundant opportunity to employ the word, and necessitating references to "early anlages." In numberless cases it is used in place of a more exact term, *e. g.*, anlage of the liver, for hepatic diverticulum, or is introduced redundantly, as "the evagination which forms (the anlage of) the arm." Its entire absence from many of the most technical and best expressed embryological papers shows clearly that it is not needed. Is the English language enriched by it? It certainly could be employed in general literature:

> Tall oaks from little anlages grow,
> Large streams from little anlages flow.

The child is anlage of the man; and Lowell might exclaim, Puritanism—the anlage of democracy!

But in the interest of scientific accuracy and purer English it should be deleted. The term, if it remains, will mark the period of German dominance in American embryology.

Frederic T. Lewis

A SIMPLE COVERING DEVICE FOR THE OCULAR OF THE MICROSCOPE

To the Editor of Science: I have experienced so much trouble and expense from the injury to eye-glasses by contact with the ocular of the microscope, that I venture to describe my experience in solving the problem in the hope that it may be of interest to others similarly annoyed. Not being able to use the microscope without the correction to vision afforded by the eye lenses, I found for a number of years that the harder glass in the ocular invariably—in the course of six months or a year—covered the eye lenses with a maze of minute scratches and abrasions, rendering them unfit for further use and necessitating a very considerable expense in the purchase of new lenses, to say nothing of the lowered efficiency of the damaged glasses in the interim.

I first secured from one of the leading optical companies a pair of heavy rubber caps such as are used by them as a dust cap to protect oculars in storage. By cutting away a circular opening in the center of the cap (do not make it too large) I found the rim of rubber kept the two sets of lenses from coming in contact. These caps can readily be shifted from one ocular to another as occasion demands, or the cost is so slight that several sets can be afforded. They are, however, rather cumbersome and force the eye away from the lens perhaps an eighth of an inch, which is not always satisfactory.

A much simpler and, on the whole, more satisfactory device may be made by taking a circular piece of ordinary sheet rubber (such as dentists use extensively) about an inch and a half in diameter; cutting a small hole at the center, and stretching and tying it securely with fine thread below the knurled cap of the ocular. This allows the eye to approach very closely to the ocular; and, besides thoroughly safeguarding the eye-glasses from injury, it does away with the very annoying noise caused by the constant shifting of the two glass lenses on each other.

I now have every ocular covered in this way and shall never again be without the comfort and economy so afforded.

Clell Lee Metcalf
Department of Zoology and Entomology,
Ohio State University

CURIOUS DIFFERENTIATION IN FROST EFFECTS

To the Editor of Science: A curious differentiation in frost effects on foliage came under the writer's observation yesterday. On Friday morning, November 1, a self-recording standard thermometer registered 32 degrees F. as the minimum during the preceding night, followed by a record of 31 degrees the follow-

ing morning. Such temperature usually produce immediate and decided effects on vegetation, assuming the character of "killing frosts."

On the following Sunday morning the writer made a run on the road leading out of Clarksdale, which for three miles traverses ground near to what was the bank of the Mississippi River before a "cut-off" several centuries ago converted this part of the river channel into a lake. The road then turns from the old river bank and traverses fields in the interior.

There is a luxuriant growth of cotton along the road for many miles, and that which is on the ground in the vicinity of the former bank of the river is green and vigorous in appearance, showing no effects of frost; while all the foliage on the cotton in the fields remote from the river bank was completely killed.

The thermometer that recorded the above temperature is located near the old river bank, and at the same elevation as the growth of cotton stalks referred to.

The writer is unable to imagine an agency that could produce the results above recited, except a difference in the character of the soil in which the cotton grows.

The soil near the old river bank is composed of river silt mainly, while that of the interior fields is a heavy, dark clay, locally called "buck shot."

The assumption is that the silty soil possesses the property of storing the sun heat during the day, and that this stored heat given out during the night protected the cotton from the frost temperature; and that the clay soil does not possess this property in the same degree.

The frost temperatures above noted came rather suddenly, without preceding low temperatures to deprive the soil of previously stored heat.

It should have been stated that the "old river channel" above referred to is not now a body of water, but by gradual filling has become arable land. Also that this is a level country.

T. G. DABNEY

QUOTATIONS

HOW TO AVOID INFLUENZA

ALTHOUGH man has lived in houses of one kind or another for several thousand years, and in western Europe since the introduction, somewhere in the fifteenth century, of glass for domestic windows, in houses which can be almost hermetically sealed, yet a human strain capable of withstanding the evil influences of unventilated rooms has not so far been evolved. Our ancestors of a few centuries ago immured themselves in tightly-closed houses, slept in bedrooms with windows closed, sometimes even in cupboards or box beds with shut doors. The result was reflected in their mortality, in the prevalence of the plague and other plagues, and in their short average span of life. Though we are wiser than they, and pay lip service to the virtues of fresh air, and talk much and learnedly on ventilation, the severity of the present pandemic of influenza is enough to show that we need to grow wiser. Dr. Leonard Hill, who has done perhaps more than any one else to give a scientific explanation of the air conditions of health, makes another contribution to our pages this week in which he relates some interesting experiments on himself and other volunteers. They lead him to urge as the best means of combating the infection of influenza, the deep breathing of cool air brought about by exercise, and by sleeping in the open air—this last perhaps a counsel of perfection. The advice applies not only to influenza itself, but to the colds and catarrhs which, in the aggregate, are responsible for so much discomfort and loss of efficiency. A striking illustration has been related to us by Colonel C. T. C. de Crespigny, D.S.O., A.A.M.C. During August, 1918, a transport left Australia bound for Great Britain. The 1,200 troops which she carried were accommodated in four troop decks of about equal capacity. Three decks were well ventilated with windsails, but the fourth deck was in this respect very unsatisfactory. Early in the voyage a form of infective pharyngitis and epidemic catarrh broke out among the troops. The incidence of the infection was ten times greater among the men occupying the

badly ventilated decks than it was among the others. In all other respects the men were exposed to precisely similar conditions; they wore the same clothes, ate the same food, and all of them slept in hammocks slung very close together. Thus the experience has the value of a carefully planned experiment in showing the effect of freely moving air as a preventive of infections of this nature. Another striking instance, recorded by Colonel Adami, F.R.S., in the first volume of his book on the "War Story of the Canadian Army Medical Corps," was noted in the review published in the first number for this year. The winter of 1914–15 was very wet, and the troops under canvas on Salisbury Plain suffered extreme discomfort, but nevertheless continued in excellent health. When, after some six weeks, the discomfort of tent life and the increasing cold of winter induced the authorities to replace the tents by huts, then influenza and throat troubles began to spread at once and rapidly, and, what was worse still, a series of cases of cerebro-spinal fever occurred.—*The British Medical Journal.*

SCIENTIFIC BOOKS

Life Zone Investigations in Wyoming. Merritt Cary. North American Fauna, No. 42. October 3, 1917, pp. 1–95; pls. I.–XV.; text figs. 1–17.

The Biological Survey has for many years been gathering data on the ecological relations of animals and plants in North America with particular reference to the transcontinental life zones. Several generalized maps of the entire continent have been published, and a series of detailed studies by states and provinces is well under way. The results of some of the latter have already been published, and another is now presented in the present report on Wyoming. This is based on a number of years' field work in the state by the author and other members of the Biological Survey.

In a brief introduction attention is called to the life zones as "a fairly accurate index to average climatic conditions, and, therefore, . . . useful as marking the limits of agricultural possibilities, so far as these are dependent upon climate." They are thus valuable as an index to the possibilities of agriculture in undeveloped regions.

With the caption "Physiography and Climate," there is also a description of the varied physiography of Wyoming, which is characterized particularly by mountains, plains and valley basins. This variety of surface produces likewise a varied climate, though mostly cool by reason of the high base level, and arid excepting on the higher mountains.

Under the heading "Life Zones of Wyoming," the transcontinental ecologic belts occurring in the state are treated at length, and a careful account is given of their divisions, if any, their area, altitudes, the most important localities covered by each, their physical and faunal characteristics, and their agricultural possibilities. For each zone there are added long lists of trees, shrubs, herbaceous plants, of mammals, and of breeding birds; mention is made also of reptiles, but of no other vertebrates and of no invertebrates. Doubtless, however, the mollusks and insects would, at least in the main, substantiate the results obtained from the plants and the higher vertebrates. The characteristics of these five zones are so carefully worked out that a summary of the author's conclusions may be worth presenting in this connection.

The Upper Sonoran Zone, which occupies most of the valleys and lower plains, from altitudes of 3,100 to 6,500 feet, is the home of the broad-leaved cottonwood, juniper, salt bush and yucca; of such mammals as *Eutamias minimus pictus, Citellus tridecemlineatus parvus, Lepus californicus melanotis;* and of such breeding birds as *Zenaidura macroura marginella, Tyrannus vociferans, Passerina amœna,* and *Icteria virens longicauda.*

The Transition Zone, which embraces the high plains, the basal slopes of the mountains, and all the foothills except the highest, and ranges from altitudes of 4,000 to 8,500 feet, is characterized by yellow pine, narrow-leaved cottonwood, and sage brush; mammals like *Odocoileus virginianus macrourus, Sciurus hudsonicus dakotensis, Neotoma cinerea cinerea,* and *Lepus townsendi campanius;* and such breeding birds as *Centrocercus urophasianus, Cryptoglaux acadica acadica, Empidonax*

ORGANIC TYPE FORMULAE

ALIPHATIC SERIES

COLUMN I.

HYDROCARBONS

SATURATED	UNSATURATED	
PARAFFINS C_nH_{2n+2} ALKANES	OLEFINES= C_nH_{2n} ALKENES	ACETYLENES= C_nH_{2n-2} ALKINES
H_3C-CH_3 METHANE		
$H_3C-CH_2-CH_3$ ETHANE	$H_2C=CH_2$ ETHYLENE or ETHENE	$HC\equiv CH$ ACETYLENE or ETHINE

ALKYL HALIDES

H_3C-Cl METHYL CHLORIDE or MONOCHLORMETHANE

R-X X=HALOGEN R=ALKYL

CH_3, C_2H_5, C_nH_{2n+1} } ALKYL GROUP=R

ALCOHOLS

H_3C-OH METHANOL or METHYL ALCOHOL

-OH ALCOHOL GROUP

H_3C-ONa SODIUM METHOXIDE or SODIUM METHYLATE

$R-CH_2-OH$ PRIMARY ALCOHOL

R_2CH-OH SECONDARY

R_3C-OH TERTIARY

ETHERS

$H_3C-O-CH_3$ METHYL ETHER

-O- ETHER GROUP

R-O-R ETHERS

ALDEHYDES

$H_3C-C(=O)H$ ETHANAL or ACETALDEHYDE

$-C(=O)H$ ALDEHYDE GROUP

$R-C(=O)H$ ALDEHYDES

KETONES

$H_3C-CO-CH_3$ PROPANONE or ACETONE

$-C(=O)-$ KETONE GROUP

$R-C(=O)-R$ KETONES

ACIDS

$H_3C-COOH$ ETHANOIC ACID or ACETIC ACID

$-C(=O)OH$ CARBOXYL GROUP

$R-C(=O)OH$ ACIDS

C=O = CARBONYL GROUP

ACID DERIVATIVES

$H_3C-C(=O)ONa$ SODIUM ACETATE

$-C(=O)OM$ M=METAL SALT GROUP

$R-C(=O)OM$ SALTS

$H_3C-C(=O)OCH_3$ METHYL ACETATE

$-C(=O)OR$ ESTER GROUP

$R-C(=O)OR$ ESTERS

DERIVATIVES CONTINUED ABOVE

COLUMN II.

$(H_3C-C(=O))_2O$ ACETIC ANHYDRIDE

$-C(=O)-O-C(=O)-$ ANHYDRIDE GROUP

$R-C(=O)-O-C(=O)-R$ ANHYDRIDES

$H_3C-C(=O)NH_2$ ACETAMIDE

$-C(=O)NH_2$ AMIDE GROUP

$R-C(=O)NH_2$ AMIDES

$H_3C-C(=O)Cl$ ACETYL CHLORIDE

$R-C(=O)$ ACYL GROUP

$R-C(=O)X$ ACYL HALIDES

SUBSTITUTED ACIDS

$H_3C-COOH$

$H_2C(Cl)-COOH$ CHLORACETIC ACID

$H_2C(OH)-COOH$ HYDROXYACETIC ACID

$H_2C(NH_2)-COOH$ AMINOACETIC ACID

$H_2C(CN)-COOH$ CYANACETIC ACID

$H_2C(COOH)_2$ MALONIC ACID

AMINES

CH_3NH_2 METHYL AMINE

$(CH_3)_2NH$ DIMETHYL AMINE

$(CH_3)_3N$ TRIMETHYL AMINE

NH_3 AMMONIA

RNH_2 PRIMARY AMINE

R_2NH SECONDARY

R_3N TERTIARY

NITRITES, NITRO COMPOUNDS, NITRATES

$R-O-N=O$ NITRITES

$R-N(=O)=O$ NITRO COMPOUNDS

$R-O-N(=O)=O$ NITRATES

NITRILES or ALKYL CYANIDES

$H_3C-C\equiv N$ ACETONITRILE or METHYL CYANIDE

$-C\equiv N$ NITRILE GROUP

$R-C\equiv N$ NITRILES

ISONITRILES or CARBYLAMINES

$H_3C-N\equiv C$ METHYL ISOCYANIDE or METHYL CARBYLAMINE

$-N\equiv C$ CARBYLAMINE GROUP

$R-N\equiv C$ CARBYLAMINES

SULPHUR COMPOUNDS

H_3C-SH METHYL MERCAPTAN

$-SH$ MERCAPTAN GROUP

$R-SH$ MERCAPTANS

$H_3C-S-CH_3$ METHYL SULPHIDE

$-S-$ THIO-ETHER GROUP

$R-S-R$ THIO-ETHERS

$R-S-S-R$ DISULPHIDES

$R-S-M$ MERCAPTIDES

$R-COSH$ THIO-ACIDS

$R_2S=O$ SULPHOXIDES

$R-S(=O)_2-R$ SULPHONES

$R-S(=O)_2-OH$ SULPHONIC ACIDS

METALLIC ALKYL COMPOUNDS

$Mg(Br)(C_2H_5)$ MAGNESIUM ETHYL BROMIDE

$Zn(C_2H_5)_2$ ZINC ETHYL

MX_R M=Mg, Zn, etc.

MR_R =METALLIC ALKIDES

COMPILED BY ALEXANDER LOWY.

wrightii, Cyanocephalus cyanocephalus, and *Hylocichla fuscescens salicicola.*

The Canadian Zone, which covers the middle mountain slopes and the highest foothill ranges, occurring at altitudes of from 7,500 to 10,500 feet, is the boreal forest belt of spruce, fir, lodgepole pine, and aspen; and is furthermore delimited by such mammals as *Alces americanus shirasi, Glaucomys sabrinus bangsi, Phenacomys orophilus, Evotomys gapperi galei,* and *Lepus americanus americanus;* with such birds as *Charitonetta albeola, Nuttallornis borealis, Melospiza lincolnii lincolnii, and Sitta canadensis.*

The Hudsonian Zone, which is a narrow belt covering the timberline region, and ranging from altitudes of 9,000 to 11,200 feet, is marked chiefly by the white-barked pine, dwarfed spruce and fir; together with such mammals as *Ovis canadensis canadensis, Eutamias oreocetes,* and *Ochotona uinta;* and such birds as *Nucifraga columbiana* and *Pinicola enucleator montana.*

The Arctic-Alpine Zone, which occupies the mountain crests and the portion of the peaks above timberline, in places from 9,500 to 13,785 feet altitude (the summit of the highest mountain in the State), is a treeless area, the vegetation of which is limited to low bushes like *Salix nivalis,* and other humble plants like *Dryas octopetala* and *Poa arctica,* and is the home of such breeding birds as *Lagopus leucurus altipetens, Leucosticte australis, Leucosticte atrata* and *Anthus spinoletta rubescens.*

The term "Upper Sonoran" as used here is really not a zone in the strict sense, and would be better called "Upper Austral," of which zone it is the western arid division. Although no mention is made of the fact, the so-called "Arctic-Alpine Zone" is really a part of the Arctic Region, which, in North America, covers the tundra area of the northern part of the continent and the mountain tops above timberline in the more southern parts of Canada and in the United States; and the four other zones of Wyoming belong to the Nearctic Region.

Following the main part of this bulletin is a well-annotated list of the conspicuous trees and shrubs of Wyoming that are of importance in the delimitation of life zones. The numerous half-tones illustrate the different types of physiography and the ecological relations of the vegetation. Of particular interest are the pictures of *Picea engelmanni* and *Pipus albicaulis* at timberline, which show the dwarfing and distorting effects of the severe climatic conditions under which they here live.

The author's careful and detailed treatment of this extremely interesting and intricate subject leaves little to be desired; and it is a matter of great regret that he could not have lived to carry his investigations into other parts of the United States.

Harry C. Oberholser

SPECIAL ARTICLES

A CHART OF ORGANIC CHEMISTRY, ALIPHATIC SERIES

In connection with the elementary organic chemistry course given at the university I deemed it advisable to have charts made to be placed in the lecture and laboratory rooms, where students may consult them at all times. In order to emphasize certain endings, type groups, etc., red lettering was used.

The chart, which is 92″ x 55″, is reproduced on the preceding page.

An analogous chart of the aromatic series is in course of preparation.

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SCIENCE

A Weekly Journal devoted to the Advancement of Science, publishing the official notices and proceedings of the American Association for the Advancement of Science

Published every Friday by

THE SCIENCE PRESS

LANCASTER, PA. GARRISON, N. Y.
NEW YORK, N. Y.

Entered in the post-office at Lancaster, Pa., as second class matter